GEOTECHNICAL INVESTIGATION:

Alterations and Additions at **4 Curra Close, Frenchs Forest**

1. Proposed Development

1.1 Demolish the existing deck and balcony on the downhill side of the house and construct a new two-story deck in the same location.

1.2 Various other external alterations.

1.3 Details of the proposed development are shown on 9 drawings prepared by TJK design, drawing number 2111, sheets numbered 1 to 9. Dated 12/10/22.

2. Site Description

2.1 The site was inspected on the 16th May, 2021.

2.2 This residential property is on the downhill side of the street and has a S aspect. It is located on the gentle to steeply graded upper middle reaches of a hillslope. The slope falls across the property at an average angle of ~5.3°. The grade increases to very steep angles in the SW corner of the property and beyond the lower common boundary. The slope above the property continues at easing angles. The grade below the property continues at steep angles.

2.3 At the road frontage, a concrete driveway runs to a garage attached to the uphill side of the house (Photo 1). Between the road frontage and the house is a gently sloping lawn surrounded by garden beds. The part two-storey brick house is supported on brick walls and brick piers. No significant signs of movement were observed in the supporting brick walls. One of the supporting brick piers was observed to be tilting downslope at an angle of ~3° (Photo 2). See **Section 13** for advice regarding this tilting pier. Competent Medium Strength Sandstone outcrops and steps down the slope to the E of the house. Most of the outcropping rocks display no significant geological defects. The lower portion of the outcropping rock was observed to be slightly

undercut (Photo 3). See **Section 12** for advice regarding the proposed deck foundations in this location. A fill extends off the downhill side of the house. The fill is supported by stepped timber retaining walls reaching ~1.4m high. These walls were observed to be tilting downslope at a maximum of ~5° (Photo 4). See **Section 13** for advice regarding these tilting retaining walls. A lawn-covered fill extends off the downhill side of these walls. This fill is supported by a concrete block retaining wall. This wall has a thick covering of vegetation and could not be easily assessed. A steep, densely-vegetated slope falls from the base of this wall to and beyond the lower common boundary (Photo 5). Due to dense covering of vegetation, only isolated sections of the rock was visible. As such this section of the slope could not be assessed for stability at the time of the inspection. We recommend the vegetation be cleared so it can be adequately assessed.

3. Geology

The Sydney 1:100 000 Geological sheet indicates the site is underlain by Hawkesbury Sandstone. It is described as a medium to coarse grained quartz sandstone with very minor shale and laminite lenses.

4. Subsurface Investigation

One hand Auger Hole (AH) was put down to identify the soil materials. Four Dynamic Cone Penetrometer (DCP) tests were put down to determine the relative density of the overlying soil and the depth to bedrock. The locations of the tests are shown on the site plan attached. It should be noted that a level of caution should be applied when interpreting DCP test results. The test will not pass through hard buried objects so in some instances it can be difficult to determine whether refusal has occurred on an obstruction in the profile or on the natural rock surface. This is not expected to be an issue for the testing on this site. However, excavation and foundation budgets should always allow for the possibility that the interpreted ground conditions in this report vary from those encountered during excavations.

See the appended "Important information about your report" for a more comprehensive explanation. The results are as follows:

AUGER HOLE 1 (~RL150.7) **–** AH1 (Photo 6)

Depth (m)	**Material Encountered**
0.0 to 0.4	**TOPSOIL**, sandy soil, dark brown, medium dense to dense, dry, fine to coarse grained from trace clay.
0.4 to 0.6	**SAND**, dark grey, damp, dense, coarse grained.

Refusal @ 0.6m grinding on rock. No water table encountered.

DCP TEST RESULTS – Dynamic Cone Penetrometer				
Equipment: 9kg hammer, 510mm drop, conical tip.			Standard: AS1289.6.3.2 - 1997	
Depth(m) Blows/0.3m	**DCP 1** (~RL149.7)	**DCP 2** (~RL147.9)	**DCP 3** (~RL147.8)	**DCP 4** (~RL150.7)
0.0 to 0.3	Rock Exposed at Surface	9	3	3
0.3 to 0.6		#	7	23
0.6 to 0.9			22	#
0.9 to 1.2			41	
1.2 to 1.5			#	
		Refusal on Rock @ 0.3m	Refusal on Rock @ 1.15m	Refusal on Rock @ 0.6m

#refusal/end of test. F=DCP fell after being struck showing little resistance through all or part of the interval.

DCP Notes:

DCP1 – Medium Strength Sandstone exposed at surface.
DCP2 – Refusal on rock @ 0.3m, DCP bouncing off rock surface, white impact dust on dry tip.
DCP3 – Refusal on rock @ 1.15m, DCP bouncing off rock surface, white and maroon fragments on damp tip.
DCP4 – Refusal on rock @ 0.6m, DCP bouncing off rock surface, white impact dust on damp brown silty tip.

5. Geological Observations/Interpretation

The surface features of the block are controlled by the outcropping and underlying sandstone bedrock that steps down the property forming sub-horizontal benches between the steps. Where the grade is steeper, the steps are larger, and the benches narrower. Where the slope eases, the opposite is true. Where the rock is not exposed, it is overlain by a sandy soil over sandy clays that fill the bench step formation. Filling has been placed across the downhill side of the property. In the test locations, where the rock is not exposed, it was encountered at depths of between 0.3 to 1.15m below the current surface, being slightly deeper due to the stepped nature of the underlying bedrock and due to the presence of filling. The outcropping sandstone on the property is estimated to be Medium Strength or better and a similar strength rock is expected to underlie the entire site. See Type Section attached for a diagrammatical representation of the expected ground materials.

6. Groundwater

Normal ground water seepage is expected to move over the buried surface of the rock and through the cracks. Due to the slope and elevation of the block, the water table is expected to be many metres below the base of the proposed works.

7. Surface Water

No evidence of significant surface flows were observed on the property during the inspection. Normal sheet wash from the slope above will be intercepted by the street drainage system for Curra Close above.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed above or beside the property. The gentle to steep graded land surface that falls across the property and continues below is a potential hazard (**Hazard One**). Collapse of the tilting timber stepped retaining walls on the downhill side of the property are a potential hazard **(Hazard Two)**.

Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two
TYPE	The gentle to steep slope that falls across the property and continues below failing and impacting on the proposed works.	Further movement of the stepped timber retaining walls below the house causing failure.
LIKELIHOOD	'Unlikely' (10^{-4})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (15%)	'Minor' (5%)
RISK TO PROPERTY	'Low' (2×10^{-5})	'Low' (2×10^{-5})
RISK TO LIFE	5.5×10^{-7}/annum	8.3×10^{-6}/annum
COMMENTS	This level of risk is 'ACCEPTABLE' provided the recommendations in **Section 13** are followed.	This level of risk is 'TOLERABLE.' To move risk to acceptable levels, the recommendations in **Section 13** are to be followed.

(See Aust. Geomech. Jnl. Mar 2007 Vol. 42 No 1, for full explanation of terms)

9. Suitability of the Proposed Development for the Site

The proposed development is suitable for the site. No geotechnical hazards will be created by the completion of the proposed development provided it is carried out in accordance with the requirements of this report and good engineering and building practice.

10. Stormwater

The survey shows a drainage easement running down the W common boundary of the property. It is recommended all stormwater or drainage runoff from the proposed development be piped to this easement through any tanks that may be required by the regulating authorities.

11. Excavations

Apart from those for footings, no excavations are required.

12. Foundations

The new two-story deck is to be supported on piers taken to the underlying Medium Strength Sandstone. This material is expected at variable depths of between 0.3 to 1.5m below the current surface where it is not exposed. No portions of the deck are to be supported on any undercut portions of the exposed rock outcrop (See Photo 3). Where footings are over an exposed sloping rock surface, they may be supported off level pads cut into the rock. Assume a maximum allowable bearing pressure of 1000kPa for footings supported off Medium Strength Sandstone.

Naturally occurring vertical cracks (known as joints) commonly occur in sandstone. These are generally filled with soil and are the natural seepage paths through the rock. They can extend to depths of several metres and are usually relatively narrow but can range between 0.1 to 0.8m wide. If a footing falls over a joint in the rock, the construction process is simplified if with the approval of the structural engineer the joint can be spanned or alternatively the footing can be repositioned, so it does not fall over the joint.

NOTE: If the contractor is unsure of the footing material required, it is more cost-effective to get the geotechnical consultant on site at the start of the footing excavation to advise on footing depth and material. This mostly prevents unnecessary over-excavation in clay-like shaly-rock but can be valuable in all types of geology.

13. Site Maintenance/Remedial Works

Where slopes approach or exceed 30° (such as on the downhill side of the property – Photo 5), it is prudent for the owners to occasionally inspect the slope (say annually or after heavy rainfall events, whichever occurs first). Should any of the following be observed: movement or cracking in retaining walls, cracking in any structures, cracking or movement in the slope surface, tilting or movement in established trees, leaking pipes, or newly observed flowing water, or changes in the erosional process or drainage regime, then a geotechnical

consultant should be engaged to re-assess the slope. We can carry out these inspections upon request. The risk assessment in **Section 8** is subject to this site maintenance being carried out.

The supporting brick pier measured to be tilting downslope at ~3° (Photo 2) is to be monitored by the owners on an annual basis keeping a photographic record of the inspections. We can carry out these inspections upon request. Should any new movement be observed, the pier is to be replaced with a new pier that meets current engineering standards.

The stepped timber retaining walls on the downhill side of the property are tilting downslope to ~5° (Photo 4). We recommend consideration be made to repairing/replacing the retaining walls during the proposed works. Alternatively, the retaining walls can be inspected by the owners on an annual basis or after heavy prolonged rainfall, whichever occurs first, keeping a photographic record of the inspections. We can carry out these inspections upon request. Should any new movement be observed, the retaining walls are to be remediated or rebuilt to current engineering standards.

14. Inspection

The client and builder are to familiarise themselves with the following required inspection as well as council geotechnical policy. We cannot provide geotechnical certification for the owner or the regulating authorities if the following inspection has not been carried out during the construction process.

- All footings are to be inspected and approved by the geotechnical consultant while the excavation equipment and contractors are still onsite and before steel reinforcing is placed or concrete is poured.

White Geotechnical Group Pty Ltd.

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Engineering Geologist and Environmental Scientist.

Reviewed By:

Ben White M.Sc. Geol.,
AusIMM., CP GEOL.
No. 222757
Engineering Geologist.

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6: AH1 – Downhole is from top to bottom

Important Information about Your Report

It should be noted that Geotechnical Reports are documents that build a picture of the subsurface conditions from the observation of surface features and testing carried out at specific points on the site. The spacing and location of the test points can be limited by the location of existing structures on the site or by budget and time constraints of the client. Additionally, the test themselves, although chosen for their suitability for the particular project, have their own limiting factors. The testing gives accurate information at the location of the test, within the confines of the test's capability. A geological interpretation or model is developed by joining these test points using all available data and drawing on previous experience of the geotechnical consultant. Even the most experienced practitioners cannot determine every possible feature or change that may lie below the earth. All of the subsurface features can only be known when they are revealed by excavation. As such, a Geotechnical report can be considered an interpretive document. It is based on factual data but also on opinion and judgement that comes with a level of uncertainty. This information is provided to help explain the nature and limitations of your report.

With this in mind, the following points are to be noted:

- If upon the commencement of the works the subsurface ground or ground water conditions prove different from those described in this report, it is advisable to contact White Geotechnical Group immediately, as problems relating to the ground works phase of construction are far easier and less costly to overcome if they are addressed early.

- If this report is used by other professionals during the design or construction process, any questions should be directed to White Geotechnical Group as only we understand the full methodology behind the report's conclusions.

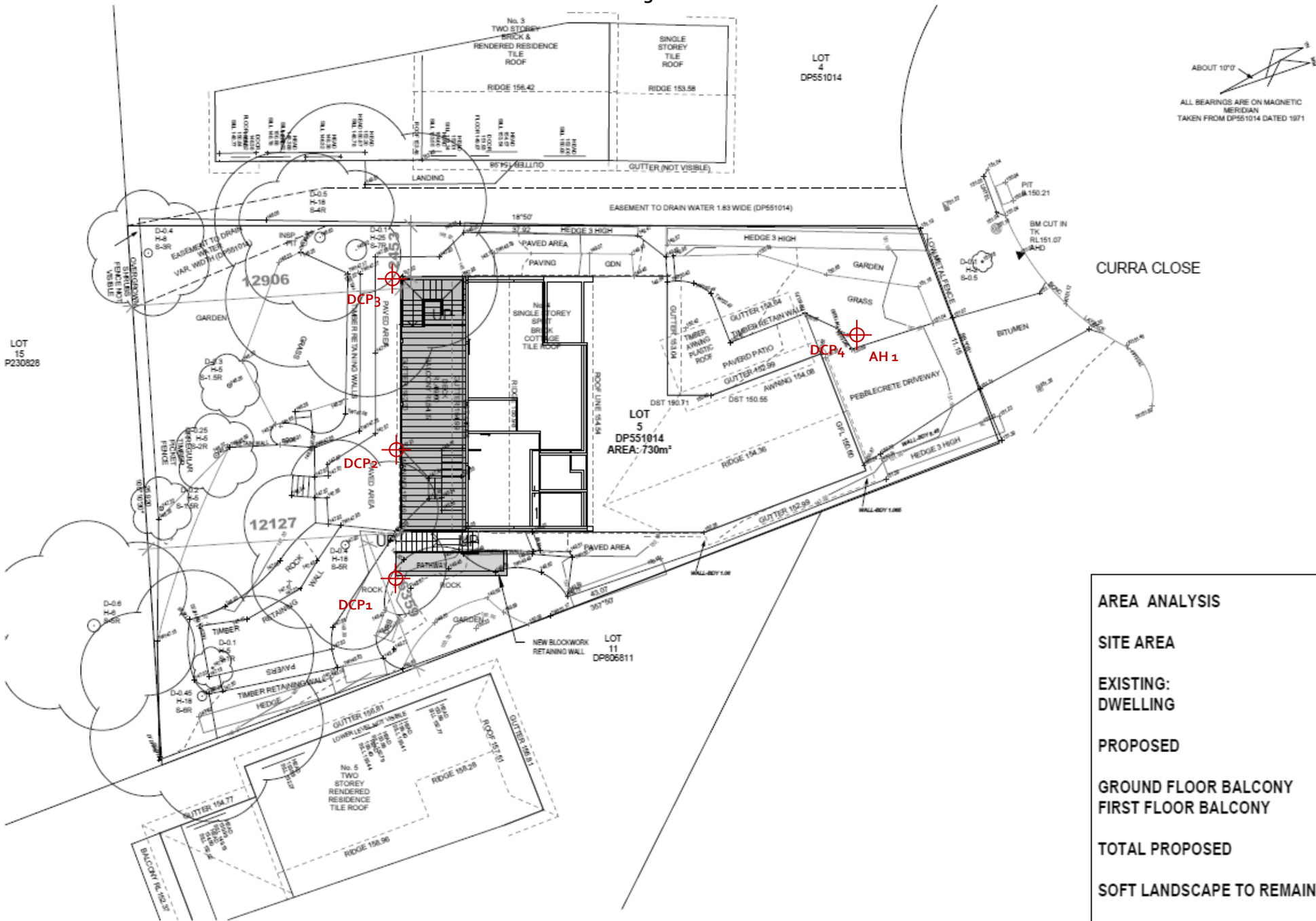
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- This report should not be applied to any other project other than that outlined in section 1.0.

- This report is to be read in full and should not have sections removed or included in other documents as this can result in misinterpretation of the data by others.

- It is common for the design and construction process to be adapted as it progresses (sometimes to suit the previous experience of the contractors involved). If alternative design and construction processes are required to those described in this report, contact White Geotechnical Group. We are familiar with a variety of techniques to reduce risk and can advise if your proposed methods are suitable for the site conditions.

SITE PLAN – showing test locations



NOTE: DRAINAGE TO BE CONNECTED TO EXISTING HOUSE
FROM PROPOSED NEW DOWN PIPES FOR NEW BALCONY ROOF.

SITE PLAN 1:200

AREA ANALYSIS

SITE AREA	730.00M2
EXISTING:	
DWELLING	247.60M2
PROPOSED	
GROUND FLOOR BALCONY	37.84M2
FIRST FLOOR BALCONY	38.62M2
TOTAL PROPOSED	76.46M2

SOFT LANDSCAPE TO REMAIN UNCHANGED

PRIVATE OPEN SPACE REMAIN UNCHANGED

No	Date	Description	By
-			

'ALL DIMENSIONS, LEVELS ,AREAS AND DRAWINGS SHALL BE CHECKED AND VERIFIED ON SITE BEFORE APPROVAL,FABRICATION AND START OF WORK'

CLIENT JULIE	JOB DECK/BALCONY	TITLE: DA		DATE: 12/10/22	SHEET: 1
ADDRESS 4 CURRA CLOSE - FRENCHS FOREST		DWG 2111	SCALE: 1 : 200	BY: KV	REV.

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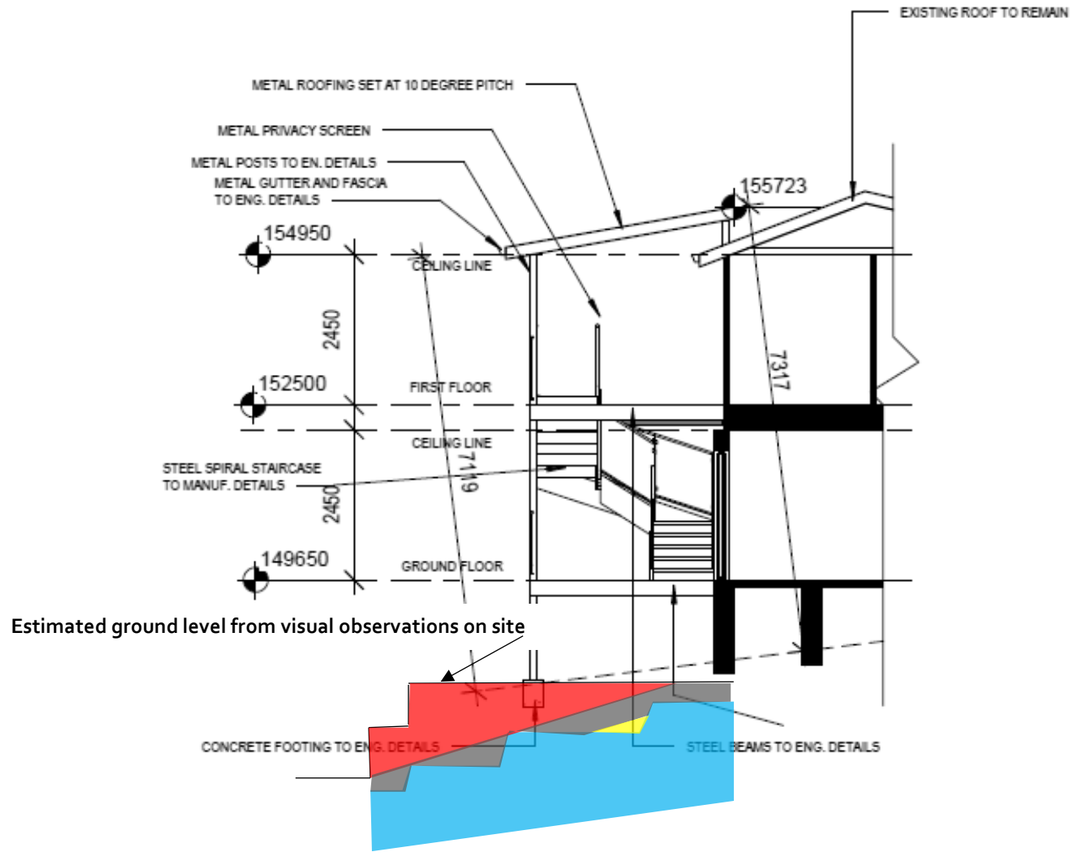
TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials

- Fill
- Topsoil
- Sand – Loose
- Hawkesbury Sandstone – Medium Strength



SECTION A-A

BCA COMPLIANCE

Section 1 Governing Reqirements

Vol. 2 Part A6, Building Classification:
A6.1 Class 1 buildings
A Class 1 building includes one or more of the following sub-classifications:
(1) Class 1a is one or more buildings, which together form a single dwelling including the following:
(a) A detached house.
(b) One of a group of two or more attached dwellings, each being a building, separated by a fire-resisting wall, including a row house, terrace house, town house or villa unit.

A6.10: Class 10 buildings and structures
A Class 10 building includes one or more of the following sub-classifications:
(1) Class 10a is a non-habitable building including a private garage, carport, shed or the like.
(2) Class 10b is a structure that is a fence, mast, antenna, retaining wall or free-standing wall or swimming pool or the

Section 3 Acceptable Construction

Part 3.7.1 Fire properties for materials and construction
Where an alternative fire property for materials and construction is proposed as a Performance Solution to that described
In Part 3.7.1, that proposal must comply with—
(a) Performance Requirement P2.3.1; and
(b) the relevant Performance Requirements determined in accordance with A2.2(3) and A2.4(3) as applicable.

3.7.1.1 General Concession - non-combustible materials

The following materials, though combustible or containing combustible fibres, may be used wherever a non-combustible is required in the Housing provisions:
(a) Plasterboard.
(b) Perforated gypsum lath with a normal paper finish.
(c) Fibrous-plaster sheet.
(d) Fibre-reinforced cement sheeting.
(e) Pre-finished metal sheeting having a combustible surface finish not exceeding 1 mm thick and where the Spreadof-Flame Index of the product is not more than 0.
(f) Sarking-type materials that do not exceed 1 mm in thickness and have a flammability index not greater than 5.
(g) Bonded laminated materials where—
(I) each lamina, including any core, is non-combustible; and
(II) each adhesive layer does not exceed 1 mm in thickness and the total thickness of the adhesive layers does not exceed 2 mm; and
(III) the Spread-of-Flame Index and the Smoke-Developed Index of the bonded laminated material as a whole do not exceed 0 and 3 respectively.

3.7.1.2 Fire hazard properties
The fire hazard properties of materials used in a Class 1 building, including floor or ceiling spaces common with a Class 10 building, must comply with the following:
(a) Sarking-type materials used in the roof must have a flammability index not greater than 5.
(b) Flexible ductwork used for the transfer of products initiating from a heat source that contains a flame must comply with the fire hazard properties set out in AS 4254.1.

3.7.2 Fire Separation of external walls
3.7.2.2 External Walls of Class 1 buildings
An external wall of a Class 1 building and any openings in that wall must comply with 3.7.2.4, if the wall is less than-

(a) 900 mm from the allotment boundary other than the boundary adjoining a road alignment or other public space; or
(b) 1.8 m from another building on the same allotment other than a Class 10 building associated with the Class 1 building or a detached part of the same Class 1 building.

3.7.2.3 Measurement of distances
a. The distance from any point on an external wall of a building to an allotment boundary or another building is the distance to that point measured along a line at right angles from the allotment boundary or external wall of the other building which intersects that point without being obstructed by a wall complying with 3.7.2.4.
b. Where a wall within a specified distance is required to comply with 3.7.2.4, only that part of the wall (including any openings) within the specified distance need be constructed in that manner.
c. Where the distance measured is between attached or detached buildings of different heights, the distance must be taken from the external wall with the highest elevation measured at right angles to a point that intersects the nearest part of a vertical projection above the adjacent building, excluding any eave overhang.

3.7.2.4 Construction of External Walls

(a) External walls (including gables) required to be fire-resisting [Referred to in 3.7.2.2 or 3.7.2.5] must-
(I) commence at the footings or ground slab, except where the external wall commences above a separating wall complying with 3.7.3.2; and
(II) extend to—
(A) the underside of a non-combustible roof covering, except that a wall may terminate not more than 200 mm from the underside of a non-combustible roof covering, where the area between the external wall and underside of the roof covering is sealed with a non-combustible fascia, gutter or flashing; or
(B) the underside of a non-combustible eaves lining; and
(III) be constructed in accordance with (b).

(b) A wall required by (a) must—
(I) have an FRL of not less than 60/60/60 when tested from the outside; or
(II) be of masonry-veneer construction in which the external masonry veneer is not less than 90 mm thick; or
(III) be of masonry construction not less than 90 mm thick.

(c) Openings in external walls required to be fire-resisting (referred to in 3.7.2.2 or 3.7.2.5) must be protected by—
(I) non-openable fire windows or other construction with an FRL of not less than –/60/–; or
(II) self-closing solid core doors not less than 35 mm thick.

(d) The requirements (c) do not apply to a window in anon-habitable room that is located adjacent to and not less than 600 mm from the boundary of an adjoining allotment or 1200 mm from another building on the same allotment provided that—
(I) in a bathroom, laundry or toilet, the opening has an area of not more than 1.2 m2; or
(II) in a room other than one referred to in (I), the opening has an area of not more than 0.54 m2 and—
(A) the window is steel-framed, there are no opening sashes and it is glazed in wired glass; or
(B) the opening is enclosed with translucent hollow glass blocks.

(e) Subfloor vents, roof vents, weepholes, control joints, construction joints and penetrations for pipes, conduits and the like need not comply with (c).

3.7.3.2 Separating walls

(a) A separating wall between Class 1 buildings, or a wall that separates a Class 1 building from a Class 10a building which is not associated with the Class 1 building must—
(I) have either—
(A) an FRL of not less than 60/60/60; or
(B) be of masonry construction not less than 90 mm thick; and
(II) commence at the footings or ground slab, except for horizontal projections to which 3.7.3.5 applies; and
(III) extend—
(A) if the building has a non-combustible roof covering, to the underside of the roof covering ; or
(B) if the building has a combustible roof covering, to not less than 450 mm above the roof covering; and
(IV) comply with (b) to (e) and 3.7.3.3 as applicable.

Section 2, Part 2.3: Fire safety
P2.3.2 Automatic warning for occupants
In a Class 1 building, occupants must be provided with automatic warning on the detection of smoke so that they may evacuate in the event of a fire to a place of safety.

Part 3.7.5: Smoke alarms and evacuation lighting
3.7.5.2 Smoke alarm requirements: Smoke alarm must-
a) be located in—
(I) Class 1a buildings in accordance with 3.7.5.3 and 3.7.5.5; and
(II) Class 1b buildings in accordance with 3.7.5.4 and 3.7.5.5.

SECTION F Health and Amenity

Part F1: Damp and Weatherproofing
- Stormwater drainage must comply with AS/NZS 3500.3.2
- Roof covering to comply with F1.5
- Sarking must comply with AS/NZS 4200, Parts 1 and 2
- Water proofing of wet areas in buildings to comply with F1.7
- Dap-proofing of floors on ground to comply with F1.11

Part 3.8: Heath and amenity
-Wet areas within the building must comply with the requirements of Part 3.8.1 Wet areas

Part 3.8.6: Sound insulation requirements

3.8.6.1 Application- Compliance with this part satisfies performance requirement P2.4.6 for sound insulation.

3.8.6.2 Sound insulation requirements
(a) A separating wall between Class 1 buildings, or a wall that separates a Class 1 building from a Class 10a building which is not associated with the Class 1 building must—
(I) have an Rw + Ctr (airborne) not less than 50; and
(II) be of discontinuous construction if it separates a bathroom, sanitary compartment, laundry or kitchen in one Class 1 building from a habitable room (other than a kitchen) in an adjoining Class 1 building.
(b) For the purposes of (a)(II), discontinuous construction means a wall system that has two separate leaves and that is not a staggered stud wall, that complies with the following:
(I) The wall has a minimum 20 mm cavity between leaves.
(II) For masonry walls, where wall ties are required to connect leaves, the ties are of the resilient type.
(III) For walls other than masonry, there is no mechanical linkage between leaves except at the periphery.
(c) A wall required to have sound insulation must continue to—
(I) the underside of the roof above; or
(II) a ceiling that provides the sound insulation required for the wall.

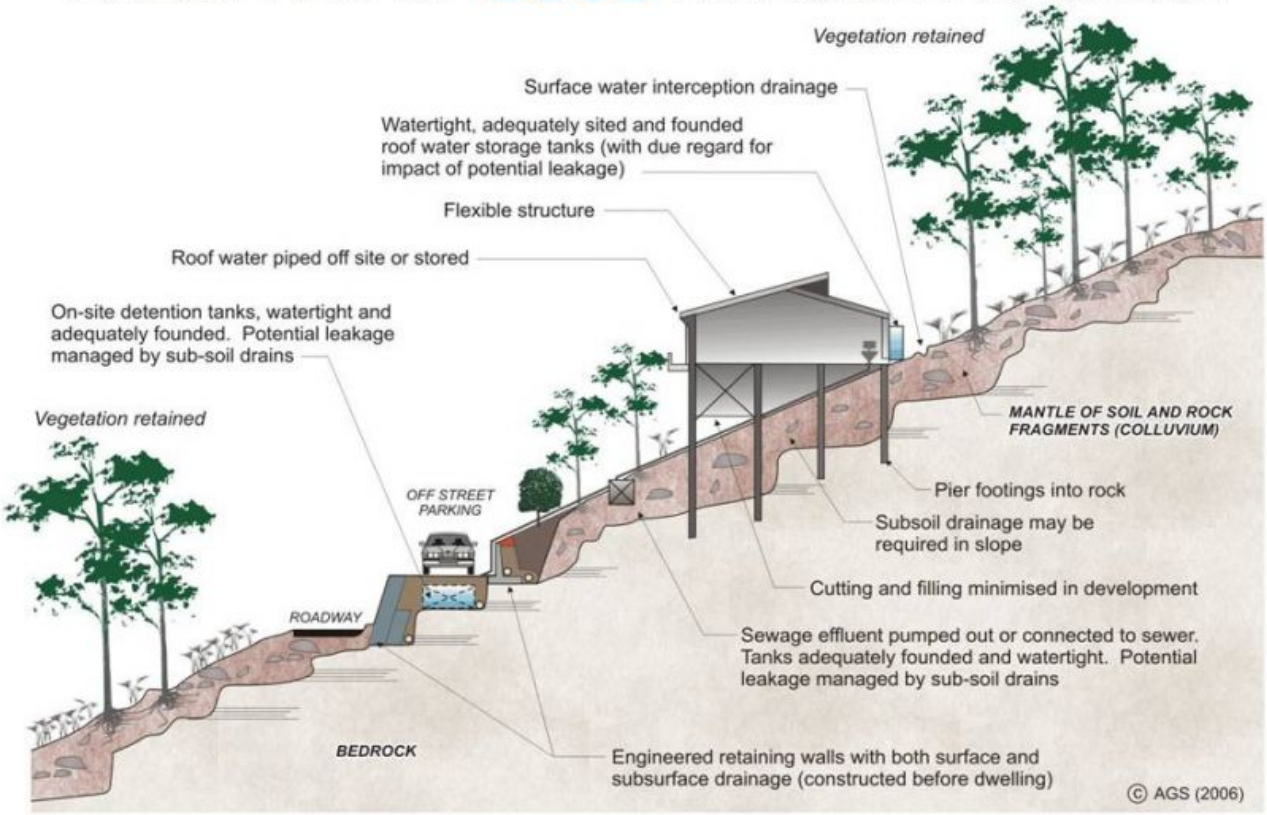
Part 3.9: Safe movement and access
- The treads and risers of the proposed stairs are to comply with Part 3.9.1.2 Stairway construction.

No	Date	Description	By
-			

'ALL DIMENSIONS, LEVELS ,AREAS AND DRAWINGS SHALL BE CHECKED AND VERIFIED ON SITE BEFORE APPROVAL,FABRICATION AND START OF WORK'	CLIENT JULIE	JOB DECK/BALCONY	TITLE: DA	DATE: 12/10/22	SHEET: 3
	ADDRESS 4 CURRA CLOSE - FRENCHS FOREST		DWG 2111 / SCALE: 1 : 100	BY: KV	REV.

TJK DESIGN
RESIDENTIAL - COMMERCIAL -INDUSTRIAL
E: tim@tjkdesign.com.au ph: 0400035512

EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE